Lab Report 2
RLC Circuits

Author:
Muhammad Obaidullah 1030313
Mirza Mohsin 1005689
Ali Raza 1012542
Bilal Arshad 1011929

Supervisor:
Dr. Montasir Qasymeh

Section 1

October 12, 2012

Abstract

In this lab we were educated in series and parallel RLC circuit analysis and achieving resonance frequency in a series RLC circuit.

1   Introduction

When we apply an AC voltage across a series combination of coil capacitor and resistor, same current will flow through them and the resistors current and voltage will be in phase while those of the capacitor and the coil will experience a phase shift.

The apparent voltage is given by this formula:
V= Z*I

The current Ic leads Ir, assuming that the capacitor is resistance less, on the other hand the current Il lags Ir , both by 90 degrees.

The frequency where the capacitive reactance is equal to the inductive reactance is called the resonance frequency the impedance at this frequency is just the resistance of the circuit.

2   Experiment Set-up

The components were placed and fixed onto the training board and wires were used to connect the components in the circuit as shown in the figures 2 and 3. A multimeter was used to calculate all the values as the multi-meter can calculate Current, resistance, and voltage.

3   List of Equipment used

- Breadboard
- Digital Multi Meter
- Function Generator
- Oscilloscope
- Breadboard Cables
- Resistor (1kΩ)
- Capacitor 0.22 μF
- Inductor 200 mH
- Silicon Diode 1N4148

4 Procedure

4.1 Exercise 1 - Series RLC circuits

First we connected a resister, conductor and a resistor in series, with Vrms = 3V (sinusoidal), f = 1 KHz and CH1, CH2 of oscilloscope as shown in the figure below.
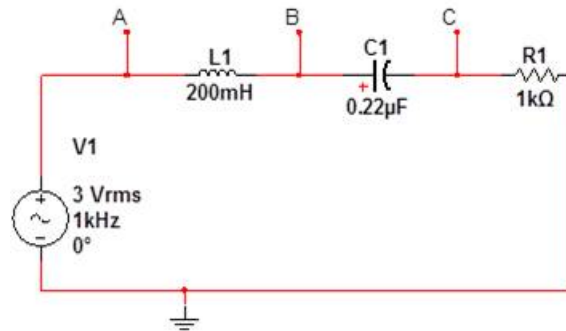

Figure 1: We had to do the calculations and find the voltages and phase angles and then compare them to the values that we get from the oscilloscope.

4.2 Exercise 2 - Parallel RLC circuits

Then we had to connect them in parallel and find the values; the connections were made as shown in the figure below:
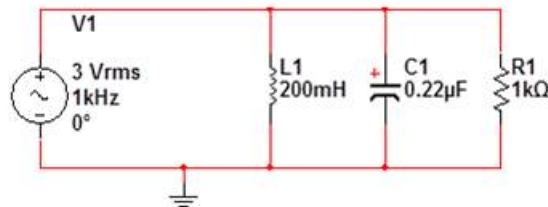

Figure 2: After finding the related values we had to construct the phasor diagrams.

4.3 Exercise 3 - Resonance of series RLC circuits

Finally we were required to observe the effects of resonance frequency in a series RLC circuit. We connected the circuit as shown below and then used the equation introduced above to find the resonance frequency and then adjusted the function generator to set as to the one we obtained from the equation.
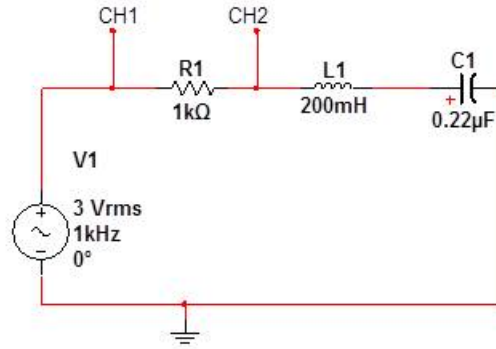
Figure 3: After finding the related values we had to construct the phasor diagrams.

5 Results and Discussions

At the end of these exercises we got the following results:-
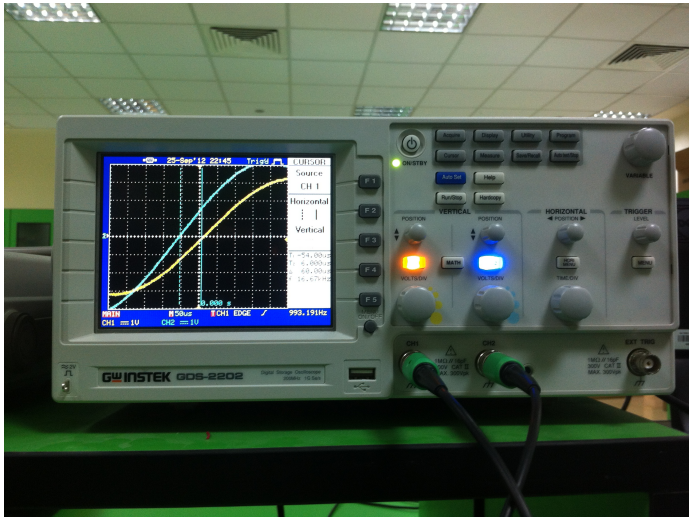
5.1 Exercise 1 - Series RLC circuits

Figure 4: Measuring the phase difference between
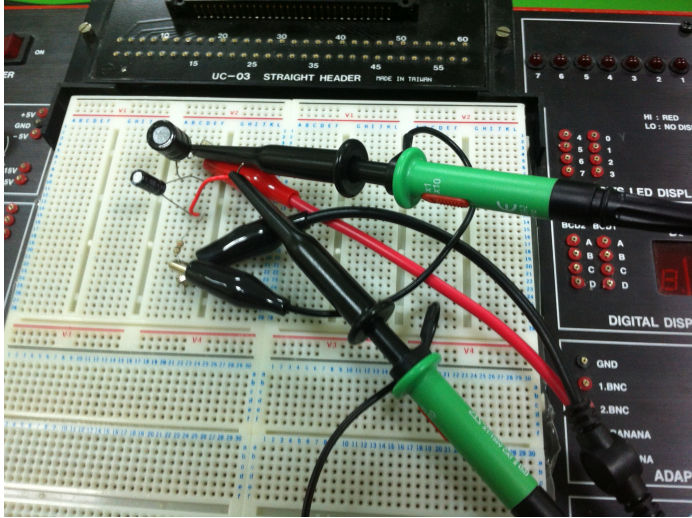the voltages using Oscilloscope
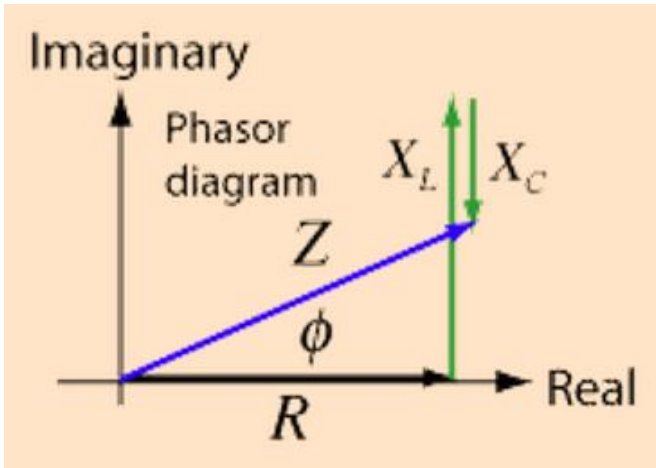
Figure 5: The series circuit on breadboard

Figure 6: The series circuit phasor diagram

5.2 Exercise 2 - Parallel RLC circuits

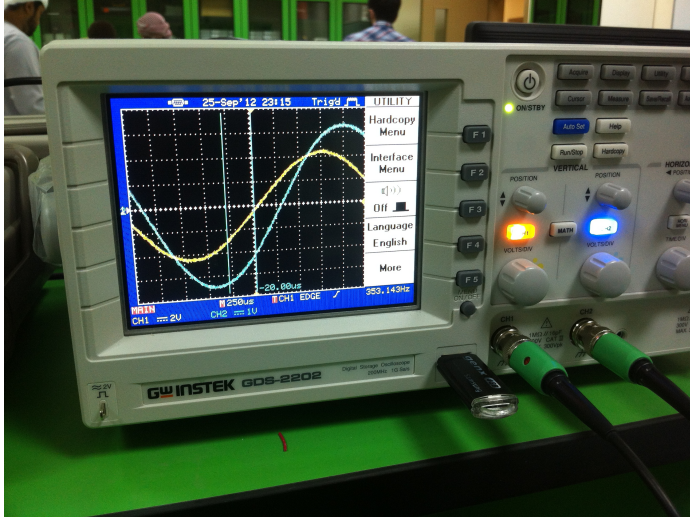## 5.3 Exercise 3 - Resonance in series RLC circuits

Figure 7: Measuring the phase difference between
the voltages using Oscilloscope

6 Conclusion

- If voltage leads current then the circuit is inductive. If current leads voltage then the circuit is capacitive.

- The calculated and multisim values are different because multisim assumes some small resistance of its ammeter and not assume not large resistance for volt meter.

- Resonance happens when the impedance of a capacitor and inductor are equal and cancel out. So only real resistance is there. The energy stored in capacitor and inductor oscillates between them.

7 Questions

Discuss the output that you have optioned and why is it different from what you expected.

We expected a straight line in the oscilloscope. But we got a small oscillating wave. This is because in real world some resistance is still there and it account for that error.
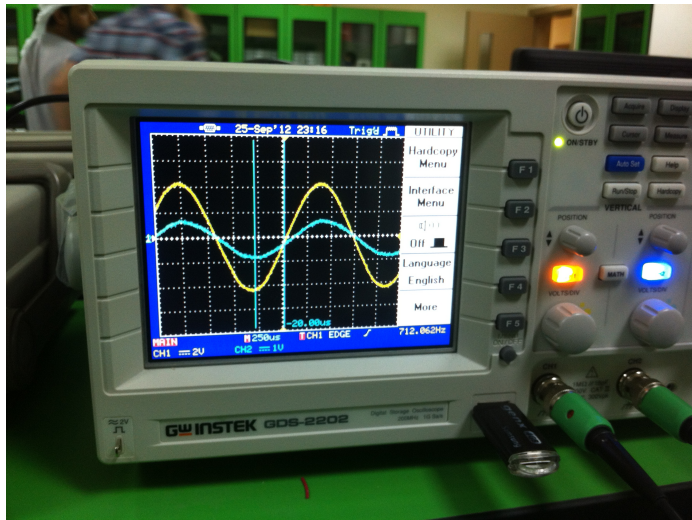
Figure 8: Successful resonance was achieved at a
particular frequency